What is claimed is:

1. An atomizer spray plate for discharging fuel oil, comprising:

a rear portion;

a front portion;

a whirl chamber extending from said rear portion to said front portion;

said whirl chamber having a central longitudinal axis extending therethrough;

said rear portion including a plurality of whirl slots extending radially inward from an outboard region of said rear portion to said whirl chamber;

said whirl slots adapted to receive fuel oil at said outboard region and supply the fuel oil to said whirl chamber; and

a discharge slot provided in said front portion for receiving the fuel oil from said whirl chamber; wherein said discharge slot comprises:

(a) a cylindrical through-hole with a diameter d having a central longitudinal axis that is co-linear with said central longitudinal axis of said whirl chamber; and

(b) at least three lobes equally spaced about the through-hole and oriented in a radial direction, each lobe having a semi-circular cross-section with radius r, said lobes extending approximately perpendicular to said central longitudinal axis of said cylindrical through-hole.

2. The atomizer spray plate of claim 1, wherein:

said front portion has a generally conical front surface surrounding said discharge slot and sloping at a

particular angle relative to said central longitudinal axis of said cylindrical through-hole;

said radius r is selected to be greater than d/2; and

said lobes are provided at a depth in said front portion to form a desired primary spray angle α that is defined by a tangent line to said lobes at a forward-most point of said front portion.

3. The atomizer spray plate of claim 2, wherein:

said depth is approximately $r(1-\sin(\alpha/2))$.

4. The atomizer spray plate of claim 2, wherein:

said desired primary spray angle α is approximately 20 to approximately 40 degrees.

5. The atomizer spray plate of claim 2, wherein:

said particular angle is approximately 85 degrees.

6. The atomizer spray plate of claim 2, wherein:

$r = d/(2*\cos(\alpha/2))$.

7. The atomizer spray plate of claim 6, wherein:

said depth is approximately $r(1-\sin(\alpha/2))$.

8. The atomizer spray plate of claim 2, wherein:

a developed secondary spray angle is achieved along a length-wise direction of each lobe.

9. The atomizer spray plate of claim 8, wherein:

three lobes are equally spaced about the through-hole and oriented in a radial direction; and

the developed secondary spray angle is approximately 35° to 45°.

10. The atomizer spray plate of claim 8, wherein:

four lobes are equally spaced about the through-hole and oriented in a radial direction to form two pairs of diametrically opposed lobes; and

the developed secondary spray angle is approximately 70° to 90°.

11. The atomizer spray plate of claim 1, wherein:

said whirl chamber is frusto-conical.

12. The atomizer spray plate of claim 1, wherein:

a portion of the fuel oil in said whirl chamber is returned to a fuel oil supply instead of being supplied to said discharge slot.

13. The atomizer spray plate of claim 1, wherein:

a ratio "A"/(d*D_2) is in a range from approximately 0.4 to approximately 0.6;

"A" is a total flow area of said whirl slots; and

D_2 is a diameter of said whirl chamber where the fuel oil is supplied to said whirl chamber from said whirl slots.

14. The atomizer spray plate of claim 1, wherein:

each of said whirl slots has a depth h in a direction parallel to said central longitudinal axis of said whirl chamber, and a width w in a direction perpendicular to said direction of said depth h; and

h/w is in a range from approximately 1.2 to approximately 1.3.

15. A method for fabricating an atomizer spray plate for discharging fuel oil, comprising the steps of:

providing an atomizer spray plate having a rear portion and a front portion;

providing a whirl chamber extending from said rear portion to said front portion;

said whirl chamber having a central longitudinal axis extending therethrough; and

providing a discharge slot in said front portion for receiving fuel oil from said whirl chamber by providing:

(a) a cylindrical through-hole with a diameter d, and having a central longitudinal axis that is co-linear with said central longitudinal axis of said whirl chamber; and

(b) at least three lobes equally spaced about the through-hole and oriented in a radial direction, each lobe having a semi-circular cross-section with radius r, said lobes extending approximately perpendicular to said central longitudinal axis of said cylindrical through-hole.

16. The method of claim 15, comprising the further step of:

providing said rear portion with a plurality of whirl slots extending radially inward from an outboard region of said rear portion to said whirl chamber; wherein:

said whirl slots are adapted to receive fuel oil at said outboard region and supply the fuel oil to said whirl chamber.

17. The method of claim 15, wherein:

said front portion has a generally conical front surface surrounding said discharge slot and sloping at a

particular angle relative to said central longitudinal axis of said cylindrical through-hole; and

said radius r is selected to be greater than d/2; and

said lobes are provided at a depth in said front portion to form a desired primary spray angle α that is defined by tangent lines to said lobes.

18. The method of claim 17, wherein:

said depth is approximately $r(1-\sin(\alpha/2))$.

19. The method of claim 17, wherein:

said desired primary spray angle α is approximately 20 to approximately 40 degrees.

20. The method of claim 17, wherein:

said particular angle is approximately 85 degrees.

21. The method of claim 17, wherein:

$r = d/(2*\cos(\alpha/2))$.

22. The method of claim 21, wherein:

said depth is approximately $r(1-\sin(\alpha/2))$.

23. The method of claim 17, wherein:

a developed secondary spray angle is achieved along a length-wise direction of each lobe.

24. The method of claim 23, wherein:

three lobes are equally spaced about the through-hole and oriented in a radial direction; and

the developed secondary spray angle is approximately 35° to 45°.

25. The method of claim 23, wherein:

four lobes are equally spaced about the through-hole and oriented in a radial direction to form two pairs of diametrically opposed lobes; and

a developed secondary spray angle is approximately 70° to 90°.

26. The method of claim 15, wherein:

said whirl chamber is frusto-conical.

27. The method of claim 15, wherein:

a ratio "A"/$(d*D_2)$ is in a range from approximately 0.4 to approximately 0.6;

"A" is a total flow area of said whirl slots; and

D_2 is a diameter of said whirl chamber where the fuel oil is supplied to said whirl chamber from said whirl slots.

28. The method of claim 15, wherein:

each of said whirl slots has a depth h in a direction parallel to said central longitudinal axis of said whirl chamber, and a width w in a direction perpendicular to said direction of said depth h; and

h/w is in a range from approximately 1.2 to approximately 1.3.